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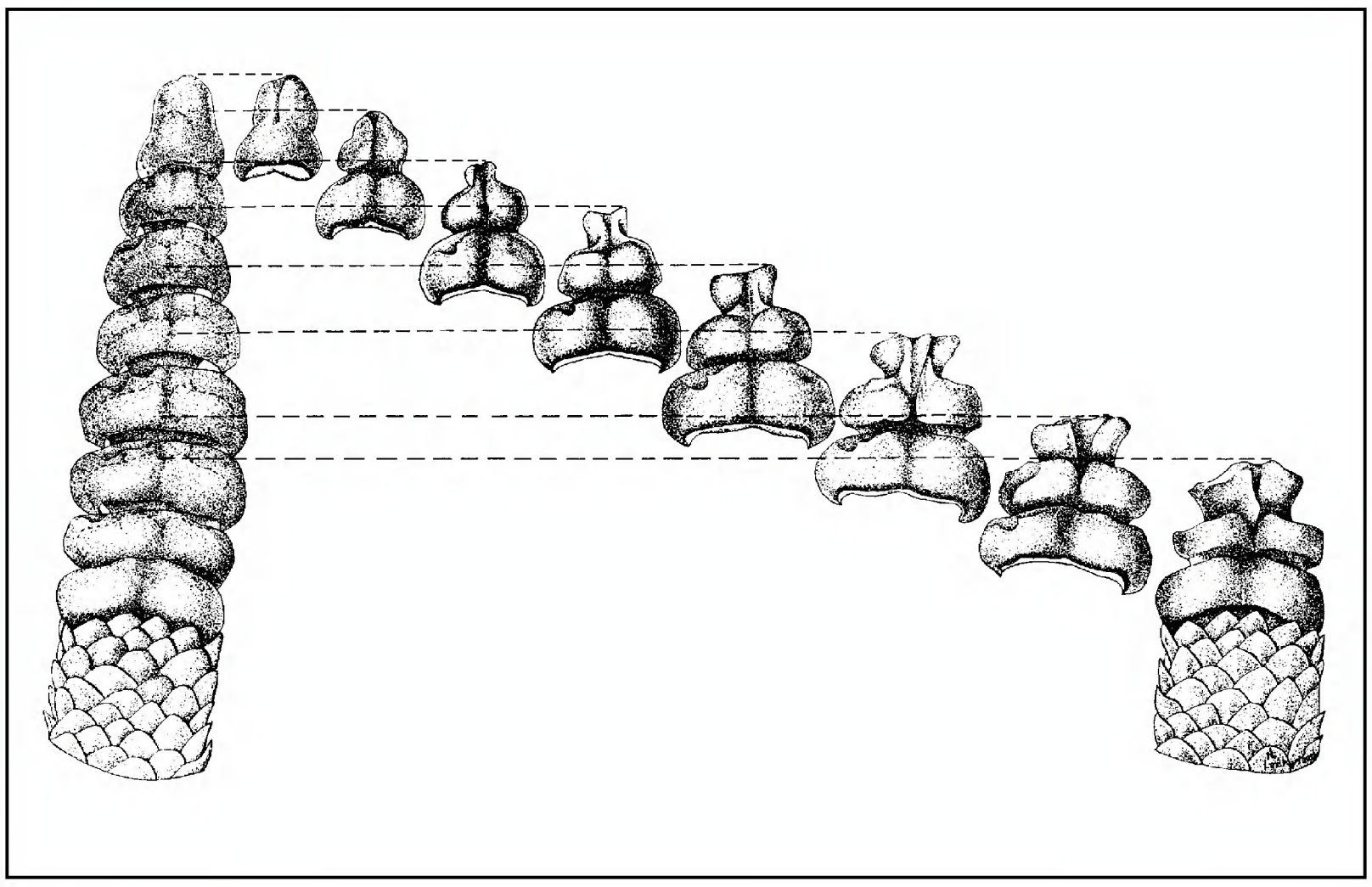

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Snake Cloacal Gland Secretions, Tail Moving Behavior, the Predator Attraction Hypothesis, and Their Proposed Role in the Evolution of the Rattle in Rattlesnakes . . . . . Karl H. Peterson 25

Notes on Reproduction of the Flat-tailed Horned Lizard, *Phrynosoma mcallii* (Squamata: Phrynosomatidae) . . . Stephen R. Goldberg 30

What You Missed at the February Meeting . . . . . John Archer 32

Problematic Philanthropy: Giving Away Money Is Harder than You Might Think . . . . . John Archer 35

Herpetology 2011 37

Unofficial Minutes of the CHS Board Meeting, February 11, 2011 38

Advertisements 39

April's Guest Speaker: Mike Rochford . . . . . Jeffrey Coleman 40

Cover: Camera lucida tracings of the complete rattle of a juvenile Pacific rattlesnake (*Crotalus oreganus*). The rattle is shown as a whole, as well as in its disarticulated form. Dotted lines connect tips of the same segments. From *Development and Growth of the Rattle of Rattlesnakes* by Arnold A. Zimmermann and Clifford H. Pope, 1948, Fieldiana: Zoology 32(6).

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Snake Cloacal Gland Secretions, Tail Moving Behavior, the Predator Attraction Hypothesis, and Their Proposed Role in the Evolution of the Rattle in Rattlesnakes

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Abstract

A conceptual analysis of the literature supports the hypothesis that snake cloacal gland secretions, tail moving behavior, and the predator/prey interactions as discussed in the Predator Attraction Hypothesis led to the development of the rattle in rattlesnakes *Crotalus* and *Sistrurus*.

Two lines of thought have been presented regarding the evolution of the rattle in rattlesnakes. The classic explanation is that the rattle evolved as a warning mechanism to potential predators/large herbivores (e.g., Cook et al., 1994; Greene, 1992, 1994, 1997; Klauber, 1972; Moon and Rabatsky, 2008; Rowe et al., 2002; Rubio, 1998; Sisk and Jackson, 1997). However, Schuett et al. (1984) proposed the rattle arose as a result of caudal luring behavior, with selection favoring both increased mimetic appearance and segmentation that allowed breakage if the lure/rattle was grabbed by too large a prey item. Some authors (e.g., Sisk and Jackson, 1997; Rabatsky, 2008; Tiebout, 1997) have questioned this suggestion of Schuett et al. (1984) but I view their conclusions as questionable at best, and not relevant to the following.

When threatened, many—if not most—snake species produce a pungent and malodorous (to humans) musk from scent glands in the tail (Graves and Duvall, 1988; Mason, 1992; Rossman et al. 1996; Weldon, 1990; Weldon et al. 1992, pers. obs.). Conventional theory largely suggests that this musk is deterrent in function (e.g., Greene, 1994, 1997; Mason, 1992; Price and LaPointe, 1981). However, Weldon and Fagre (1989) reported that coyotes, *Canis latrans*, were attracted to and rolled and rubbed at field stations scented with western diamondback, *Crotalus atrox*, scent gland secretion; domestic dogs, *Canis familiaris* exhibited urination postures and mouthed filter papers treated with the same. Furthermore, domestic cats *Felis catus* rubbed and rolled on filter papers treated with ratsnake, *Elaphe obsoleta*, scent gland secretions (Wright and Weldon, 1990). Also, Greene (1994, 1997) reported a captive kit fox, *Vulpes macrotis*, mouthed but did not kill a ring-necked snake, *Diadophis*, smeared with its own cloacal gland secretions. It appears that snake scent gland secretions , instead of functioning as a repellent to predators, in some snake taxa may attract and chemically alter the predatory behavior of some snake predators. Chemical modification (reduction) of predatory behavior is also seen in kit foxes and coyotes when squirted with blood by Texas horned lizards, *Phrynosoma cornutum* (Sherbrooke and Middendorf, 2004; Sherbrooke and Mason, 2005 respectively; see also Middendorf et al. [2001]) which supports the concept (biochemical alteration of reptile predator species' predatory behavior) in the broadest sense: that scent gland secretions of some snake taxa may do the same (be an attractant and/or modify snake predator behavior). An attractant snake scent gland secretion could serve as a chemical, secondary predator attractant; chemical and auditory predator attractant alarm signals are documented in other vertebrate taxa (e.g., Cashner, 2004; Chivers et al., 1996; Mathis et al., 1995; Schuett and Gillingham, 1990; Wisenden and Thiel, 2002). This phenomenon is known as the Predator Attraction Hypothesis (PAH). The PAH states that an alarm signal expressed during predation may attract additional predators that interfere during the predation attempt, giving the prey an opportunity to escape. I propose the term "squabbling behavior" be used for this interaction.

Many snake taxa vigorously vibrate their tails when they feel threatened (e.g., Gans and Maderson, 1973; Greene, 1992, 1994, 1997; Klauber, 1972; pers. obs.); rapid tail vibration via increased metabolic capacity in tail muscles logically may have preceded the development of the rattle (Moon, 2001). However, it is necessary to explain how rapid tail vibration is a selective trait during snake/predator interactions. I have observed two types of tail vibration in colubrid and viperid snakes. One (in colubrids and the pit viper genera *Agkistrodon*, *Bothrops*, *Cerrophidion*, *Ophryacus* and *Porthidium*) is a lower frequency (little sound produced) side-to-side motion roughly analogous to the "whip like tail movements of tail" in Carpenter and Ferguson (1977). The second (in colubrids and viperids, including a few of the above pitviper species within the listed genera) is analogous to the "vibrating tail with very rapid back and forth movements" hence blurring the tail (producing an audible buzz against substrate) in Carpenter and Ferguson (1977). It is the second mode of tail vibration I am emphasizing here in the context of rattle evolution. One of the conventional interpretations (that a vibrating nonvenomous snake tail is "diematic" [frightening]) is somewhat absurd, since many nonvenomous snake species show tail damage/loss that is accepted as being caused by predators, and some species actually have especially long tails that allow breakage over multiple predatory encounters (Greene, 1994; Slowinski and Savage, 1995). I propose that attractant scent gland secretions and rapidly vibrating tail behavior co-evolved in an ancestral pitviper to specifically attract the attention of predators to an expendable body part (the tail, as discussed in Greene [1994] and Slowinski and Savage [1995]; see also Ernst [1992]) that led to the protorattle and rattle (also an expendable body part; perhaps the strongly banded tail of some species [e.g., *Crotalus atrox* and *C. scutulatus*] serves to focus predator attention to the tail). Rossman et al. (1996) reported an observation of a captive Mexican garter snake, *Thamnophis fulvus*, that can serve as a general model for this hypothesized scenario in a pre-protorattle ancestor: "One captive specimen, when agitated, was seen to hide its head in its coils and elevate the tail, which it slowly writhed about while exuding the contents of its cloaca." Arnold and Bennett (1984)

observed similar behavior in the antipredator display of the garter snake *T. radix*. The only behavioral change needed from these behaviors to the one I am emphasizing here is a move from slow undulations to rapid vibration of the tail. Other authorities have reported similar behavior in a number of snake taxa (e.g., Gehlbach, 1970 [a variety of species]; McCoy and Gehlbach, 1967 [*Rhinocheilus lecontei*]); while cited in Greene (1994) the original papers must be reviewed for full descriptions of the behaviors. Also, as suggested in Schuett et al. (1984), a protorattle and segmented tail could have arisen as a result of caudal luring, with a segmented tail being adaptive both as a mimetic lure and as an expendable body part if grabbed by a too large prey item (or a predator, as I suggest here). Sweet (1985) hypothesized the vibrating tail of the gopher snake *Pituophis melanoleucus* (now *P. catenifer*) is in some populations an auditory mimic of the northern Pacific rattlesnake *C. viridis oreganus* (now *C. oreganus*), which I cite here as an example of how loud (i.e., successful) nonvenomous snake tail vibrations (against a substrate) can be in drawing predator attention to the tail. Numerous other authors (e.g., Greene, 1994) have also commented on the intensity of sound produced by nonvenomous snake tail vibrations in leaves/on substrate and the parallel defensive nature of tail vibration in viperid species, or also proposed outright mimicry of rattlesnakes by members of the genus *Pituophis* (Kardong, 1980; Werler and Dixon, 2000). However, my hypothesis suggests that the vibrating tails of all snake species that do so act as above, with the rattlesnake's vibrating tail serving an additional function (an auditory secondary predator attractant) as described below. Because of the upper limit of the intensity of sound produced by the presumptive ancestral snake tail vibration, the predator/prey species involved were probably group foraging, scent-dependent species in Eurasia like the ancestral form of the raccoon dog *Nyctereutes procyonides* (a primarily nocturnal scent-dependent, group foraging predator) whose ancestors ranged over Eurasia and North America 4–10 mya (Nowak, 1991) and the ancestral pitviper that invaded North America via the Bering Land Bridge (e.g., Gloyd and Conant, 1990; Greene, 1992). Also, numerous ancestral mustelid and procyonid species existed in the (Mexican) Madrean Occidental, where rattlesnake evolution likely began (Greene, 1997; Place and Abramson, 2004). As rattlesnakes invaded lower, northern and southern habitats, with additional more widely dispersed predators (e.g., canids, felids), larger snake/rattle size would have been selected for in some circumstances. And of course larger snake/rattle size would have been selective when rattlesnakes encountered the large herbivores of the North American plains. Some recent reports support this hypothesis.

Rowe et al. (2002) reported that during staged encounters between rock squirrels *Spermophilus variegatus* and western diamondback rattlesnakes *C. atrox*, squirrels sometime attack the snake and " . . . often direct their attack at the tail (M. Rowe, unpubl.)" A ground squirrel that is resistant to rattlesnake venom (as *S. beecheyi* is to northern pacific rattlesnake *C. oreganus* venom [reviewed in Owings and Coss, 2008]) would still be subject to a potentially serious/fatal injury if a fang(s) penetrated the eye, spine or vital organs. And even with a high degree of resistance to rattlesnake venom, there is a kinetic process necessary to initiate immune system response; in humans, the lag time between bite and immune system response results in mild/severe pain and swelling (pers. obs.), which could significantly compromise squirrel locomotion if the same is true for them. (Whether resistance is genetic [squirrels] or acquired [myself, to *C. lepidus* venom] circulating antibodies cannot instantaneously bind to the level of antigens present in injected venom.) Thus, there must be a "compelling reason" for a squirrel to risk serious injury/death in attacking a rattlesnake tail, which I suspect is the need to silence the rattle and avoid attracting the hypothesized (mammalian) secondary predator. The reason I consider the rattle as targeting a nearby secondary mammalian predator(s) is because there is a limit to how far the sound of rattling is audible. Keeping in mind it's likely that predatory mammals have much more sensitive hearing than humans, Fenton and Licht (1990) reported rattle intensities were 68–88 decibels at one meter, Rubio (2010) reported rattles could be heard from a few yards (small, montane species) to 50 feet (*Crotalus*) away, Werler and Dixon (2000) reported western diamondback *C. atrox* rattling could be heard up to 100 feet away, I have heard large rattlesnakes (*C. atrox*, *C. viridis*, *C. scutulatus*) audible at distances of ca. 100 feet, and I have spoken to many field biologists who generally concur with the above (see also discussion in Klauber, 1972). Of course, how audible a rattle is depends on the physical structure of the habitat.

A number of authorities have commented on the behavior of rock rattlesnakes *C. lepidus* ssp., which continue rattling from underneath cover (i.e., rocks) but exhibiting "curiosity" by remaining in visual contact of what is disturbing them (in this case, humans) (e.g. Woodin, 1953 [cited in Klauber, 1972]; Rubio, 2010; Werler and Dixon, 2000; Justin Garza, pers. com.; R. Humphries, pers. com.; pers. obs.) This hypothesis suggests it is not "curiosity" (while descriptive of the behavior, and a term I have used myself in the past to describe the same, it is nonetheless an anthropomorphism) that is responsible for this behavior; it is a rock rattlesnake looking to see if its continued rattling attracts a secondary predator. Rattling from underneath cover and exposing "your" location would seemingly only be selective if it attracted a secondary predator.

Returning to squirrel/rattlesnake interactions, Owings and Coss (2008) also reported that aggressive confrontation of rattlesnakes by squirrels generates escalated defensive (rattling) behavior by rattlesnakes, which allows squirrels to assess the rattlesnake's vulnerability as determined by body size and temperature. However, the above suggests a rattlesnake may be reluctant to rattle "hoping" it can avoid attracting a secondary predator, and it is only persistent attack by squirrels that causes the rattlesnake to rattle. It is also an exaggeration to define rattlesnakes as "vulnerable" to ground squirrels. In their review of rattlesnake/ground squirrel interactions, Owings and Coss (2008) state the following: "We have observed squirrels on two separate occurrences mauling rattlesnakes during natural encounters in the field; both were very young rattlesnakes, and one was killed (Hersek, 1990)." These are the sole data on which they are defining rattlesnakes as being vulnerable to squirrels. Rabatsky (2008) compounds this exaggeration even further by stating the following: "In rattlesnakes, enemies frequently direct their attacks towards the tail and the rattle (Rowe et al., 2002)."

The "enemies" she is referring to are ground squirrels, which are prey items of *C. oreganus* simply exhibiting antipredator behavior. If ground squirrels can't assess rattlesnake "vulnerability" by size alone, how can they assess other snake predator *Lampropeltis*/*Pituophis* size, or the size of any physical object? And if prompting rattling is so critical in assessing rattlesnake "vulnerability," why would a squirrel preferentially attack the tail? That attacking the tail is a stereotypical and important behavior ground squirrels exhibit is seen in the data reported above as well as that reported by Mitrovich and Cotroneo (2006), who found that squirrels (*S. beecheyi*) attacked the tails of large (plastic) replica snakes significantly more often than the head or neck. Also, Haywood and Harris (1971) reported that during a natural encounter involving a rock squirrel (*S. variegatus*) and a bull snake (*Pituophis melanoleucus* [now *P. catenifer*]), the squirrel attacked both the head and the tail of the snake.

Going further out on a speculative limb (i.e., engaging in the "Speculative Metaphysics" of Steinbeck [1995]), I suspect the interaction between rattlesnakes and ground squirrels could be even more complex. Squirrels exhibit "tail flagging," a behavior that is snake specific (Owings and Coss, 2008). While tail flagging could be viewed as communicative to other squirrels, or distractive to the rattlesnake while the squirrel attacks the tail, I think it could serve another function, or two at once. I think tail flagging could be a signal the squirrels use themselves to attract a secondary predator (a sight oriented predator, like a hawk). Squirrels vocalize (at least in the case of California ground squirrel *S. beecheyi* and northern pacific rattlesnakes *C. oreganus* interactions (Owings et al., 2001; Owings and Coss, 2008), throw substrate, and elicit rattling during encounters; each seems sufficient to communicate rattlesnake presence to nearby squirrels. Also, there is no association between rates of tail flagging and number of nearby squirrels during rattlesnake/squirrel (*S. variegatus*) interactions (Owings et al., 2001), so perhaps the tail flagging behavior is a visual signal for avian secondary predators.

In summation, I propose the evolution of the rattle of rattlesnakes took place in the Mexican Plateau, as suggested in Greene (1997) and Place and Abramson (2004) via predatory selective pressure by group foraging mammalian predators, with rattle evolution serving both as an expendable body part and as an auditory secondary predator attractant, with subsequent size increase (via allometric growth) to attract more widely dispersed predator species as rattlesnakes occupied southern and northern habitats. I base this proposal on: a) the attractant and behavior altering nature of snake scent gland secretions reported in Weldon and Fagre (1989) and Wright and Weldon (1990), and b) the tail vibrating behavior present in numerous snake lineages (e.g., Gloyd and Conant, 1990; Greene, 1994, 1997; pers. obs.) that seems to focus predator attention to an expendable body part (Greene, 1994; Slowinski and Savage, 1995) on which selection could favor the development of a protorattle and rattle. This proposal also incorporates the hypothesis of Schuett et al. (1984), which may be seen as inclusive within (or having evolved prior to or in parallel with) the above scenario. In northern plains habitats, the rattle also functioned as a warning mechanism to large, grazing herbivores (exaptation [Gould and Vrba, 1982]), but still functioned as a secondary predator attractor and as an expendable body part. The importance of scent gland secretions and tail vibrating behavior in ancestral snake species' evolution and dispersal in general is suggested as well. While I cheerfully acknowledge the highly speculative nature of the above, it is not outside the bounds of reason (see Husserl [1962]), and I hope it will focus renewed attention on this enigmatic appendage of rattlesnakes.

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Notes on Reproduction of the Flat-tailed Horned Lizard, *Phrynosoma mcallii* (Squamata: Phrynosomatidae)

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Abstract

A histological examination of gonadal material from the flat-tailed horned lizard, *Phrynosoma mcallii*, revealed a spring–early summer period of spermiogenesis (sperm formation). Recrudescence (renewal of germinal epithelium in the seminiferous tubules for the next period of spermiogenesis) was observed in autumn. Yolk deposition was underway in April. Reproduction continued into June (no July female sample was available). Mean clutch size for ten females was 4.5 ± 1.4 SD, range = 2–7. Presence of one May female with corpora lutea from a previous clutch and concurrent yolk deposition for a subsequent clutch confirms *P. mcallii* may produce a second egg clutch during the same year as reported in Howard (1974). My finding of one female with a clutch size of two is a new minimum clutch size record for *P. mcallii*.

The flat-tailed horned lizard, *Phrynosoma mcallii*, is known to occur from the low desert of southern California to the head of the Gulf of California, extreme northeastern Baja California to extreme southwestern Arizona and northwestern Sonora, Mexico (from below sea level to around 250 m) (Stebbins, 2003). There is some information on its reproductive biology in field guides: (Stebbins, 1954, 2003; Behler and King, 1979; Lemm, 2006; Brennan and Holycross, 2009; Rorabaugh and Young, 2009). Norris (1949) reported a gravid female from May and Howard (1974) reported in detail on monthly events in the reproductive cycle. *Phrynosoma mcallii* has the smallest range of any horned lizard in the United States (Barrows and Allen, 2009). Almost half of its habitat has been lost to urban and agricultural development (Rorabaugh and Young, 2009). Therefore, information on its reproduction is important for formulating conservation legislation to protect this species. The purpose of this note is to report a new minimum clutch size and histological verification that *P. mcallii* may produce multiple clutches in the same year.

Methods

A sample of 43 *P. mcallii* consisting of 14 adult males (mean snout–vent length, SVL = 68.5 mm ± 3.8 SD, range = 60–75 mm; 18 adult females, mean SVL = 69.3 mm ± 4.4 SD, range = 61–77 mm and 11 subadults, mean SVL = 45.1 mm ± 10.2 SD, range = 31–59 mm) was examined from the herpetology collection of the Natural History Museum of Los Angeles, Los Angeles, California, USA. *Phrynosoma mcallii* were collected 1957 to 1979. Specimens examined and locations are listed in the Appendix.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin and sections were cut at 5 µm, and stained in Harris hematoxylin followed by eosin counterstain. Histology slides are deposited in LACM.

Enlarged ovarian follicles (> 4 mm length) were counted. An unpaired *t*-test was used to test for differences between male and female SVLs and the relationship between female SVL and clutch size was examined by linear regression analysis using Instat 3 (Graphpad, San Diego).

Results

There was no significant difference between means of adult male and female *P. mcallii* samples ($P = 0.602$). Monthly stages in the testicular cycle are in Table 1. Three stages of the testicular cycle were present: (1) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids; (2) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (3) recrudescence, a proliferation of germ cells occurs in the form of spermatogonia, primary and secondary spermatocytes for the next period of spermiogenesis. The smallest reproductively active male (spermiogenesis) measured 60 mm SVL (LACM 8860) and was collected in Sonora, Mexico, in May.

Monthly stages in the ovarian cycle are in Table 2. Three stages were observed: (1) quiescent, no yolk deposition is present; (2) yolk deposition in progress, vitellogenic granules noted in the ooplasm; (3) enlarged follicles > 4 mm diameter, prior to ovulation. No females were found with eggs in the oviducts.

Table 1. Monthly stages in the testicular cycle of 14 *P. mcallii*.

Month	*N*	Regressed	Recrudescence	Spermiogenesis
March	2	1	1	0
April	4	0	2	2
May	4	0	0	4
June	2	0	0	2
July	1	1	0	0
October	1	0	1	0

Table 2. Monthly stages in the ovarian cycle of 18 *P. mcallii*.

Month	*N*	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm
March	1	1	0	0
April	4	2	1	1
May	6	1	2*	3
June	6	0	0	6
August	1	1	0	0

* One female from May contained corpora lutea from a previous clutch and concomitant yolk deposition for a subsequent clutch.

Females were reproductively active beginning in April and continuing into June. The cycle was over by August (Table 2). No July females were examined so I have no information on reproductive activity during this month, however, Howard (1974) reported *P. mcallii* females were reproductively active in July. The smallest reproductively active female (LACM 74798) measured 63 mm SVL exhibited early yolk deposition and was collected in Sonora, Mexico, in April. Mean clutch size for ten females (follicles > 4 mm length) was 4.5 ± 1.4 SD, range = 2–7. One female (LACM 8859) collected 13 May 1966 contained corpora lutea from a previous clutch and concomitant yolk deposition for a subsequent clutch, indicating *P. mcallii* has potential for producing multiple clutches in the same year. Linear regression analysis revealed the relationship between female body size (SVL) and clutch size was not significant (P = 0.197) but this may be due to my small sample size (n = 10).

Discussion

Howard (1974) published the only detailed data on the reproductive cycle of *P. mcallii*. My results are similar to his with some variations. I found slightly smaller minimum sizes for reproduction (63 mm SVL in females) as opposed to 66 mm (Howard, 1974) and 60 mm in males as opposed to 63 mm SVL (Howard, 1974). Both Howard (1974) and I concur that *P. mcallii* may produce two egg clutches in the same reproductive season. My mean clutch size of 4.5 eggs is close to that of 4.7 ± 0.16 SE, range = 3–7 (Howard, 1974). However, one female from June (LACM 25089) with two enlarged ovarian follicles is a new minimum clutch size for *P.mcallii*.

Acknowledgment

I thank C. Thacker (LACM) for permission to examine *P. mcallii*.

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Appendix

Phrynosoma mcallii examined by locality from the Natural History Museum of Los Angeles County (LACM), Los Angeles, California.

Arizona: Yuma County, LACM 26970, 101561.

California: Imperial County, LACM 4355, 8862, 74261, 101562, 101563, 123342, 138412; Riverside County, LACM 4354, 19768, 19769, 26971, 74194, 101562, 101564, 101566, 101567; San Diego County, LACM 8472, 19770, 52762, 2763, 101570, 101572, 138406-138411.

Mexico: Sonora LACM 6618, 6619, 8854, 8857-8860, 25089, 25091, 74798, 101573, 101575, 101576.

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What You Missed at the February Meeting

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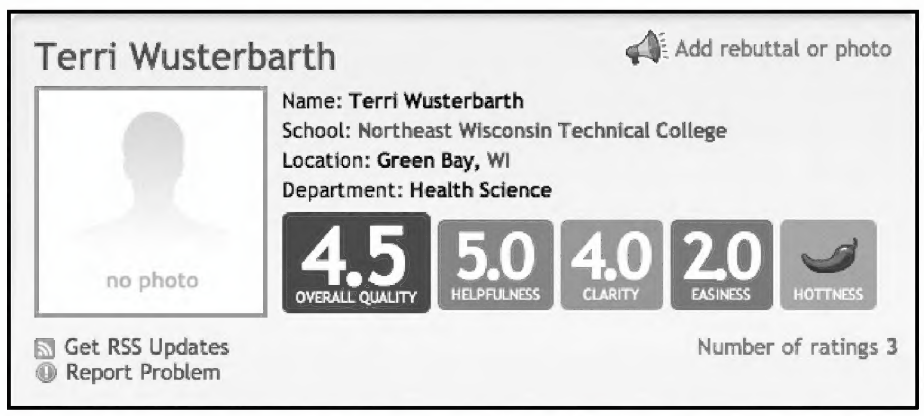
I once took a course where the professor stood in front of the class and read his dissertation. That's it. Each class period he would stand at the lectern, unfold his dissertation, and begin reading — in a monotone — until the end of the class. Every time. Until the end of the course. It was torture. Only a little less aggravating is someone who throws lots of slides full of text on the screen and then reads each word. Every once in awhile that's needed, but I don't need to have all the text read to me all of the time.

Photograph of Theresa Wusterbarth by Dick Buchholz.

Our February speaker had lots of text slides and handled them with what I thought was nearly perfect technique—referring to them, reading parts, explaining parts, and rephrasing as needed to clear up things that might not read well. And she did all this pretty much on the fly as she tried to edit her lecture in order not to run too long. It couldn't have gone on too long as far as I was concerned. After the pleasure of listening to her presentation, I appreciated some of the research I had done on Terri.

Terri grew up in Green Bay, Wisconsin, and earned a B.S. in Biology from St. Norbert College in De Pere, Wisconsin. While she was an undergraduate, she worked at an urban wildlife sanctuary in Green Bay as an animal keeper and wildlife rehabilitator. She then went on to Central Michigan University to work on an M.S. in Conservation Biology, and as a student in Dr. Jim Gillingham's lab, she studied nest predation and effects of human recreation on the wood turtle for her thesis research, in addition to working on a ribbon snake project for Dr. Gillingham. Afterward, she traveled to Northern Illinois University where she earned a Ph.D. studying natricine snake mating systems in Rich King's lab. A portion of her research was also completed in John Parrish's reproductive physiology lab at the University of Wisconsin. She currently teaches human anatomy and physiology at Northeast Wisconsin Technical College (NWTC) in Green Bay, Wisconsin. That's what she emailed me about herself. Here's what I'd like to add.

Terri received a grant from the CHS in support of her Ph.D. When we award those grants we politely request that the recipient let your society know the progress and conclusions of the research. We never again hear from many of them, but at the end of last year I received an email from Terri offering to speak to the CHS about her studies. As we exchanged emails about the engagement I came to look forward to meeting her. She understood my humor and displayed a keen wit of her own. All too often I'm told that those two traits are mutually exclusive. While gathering background on her I came across the web site ratemyprofessors.com. Terri's students at NWTC rated her course very difficult but Terri as very helpful and clear. All raters ranked her course as very interesting. If I were to teach a course, I would hope that students would rate me exactly like Terri, difficult but nice, clear, helpful, and interesting. I knew I'd like her. Meeting her confirmed my expectations. She's very enthusiastic, very approachable, and extremely accommodating. If you weren't there, you missed another truly engaging speaker.



http://www.ratemyprofessors.com/ShowRatings.jsp?tid=929397

Terri's score on ratemyprofessors.com, a score I'd strive for if I were a professor. I'd never get the chili though.

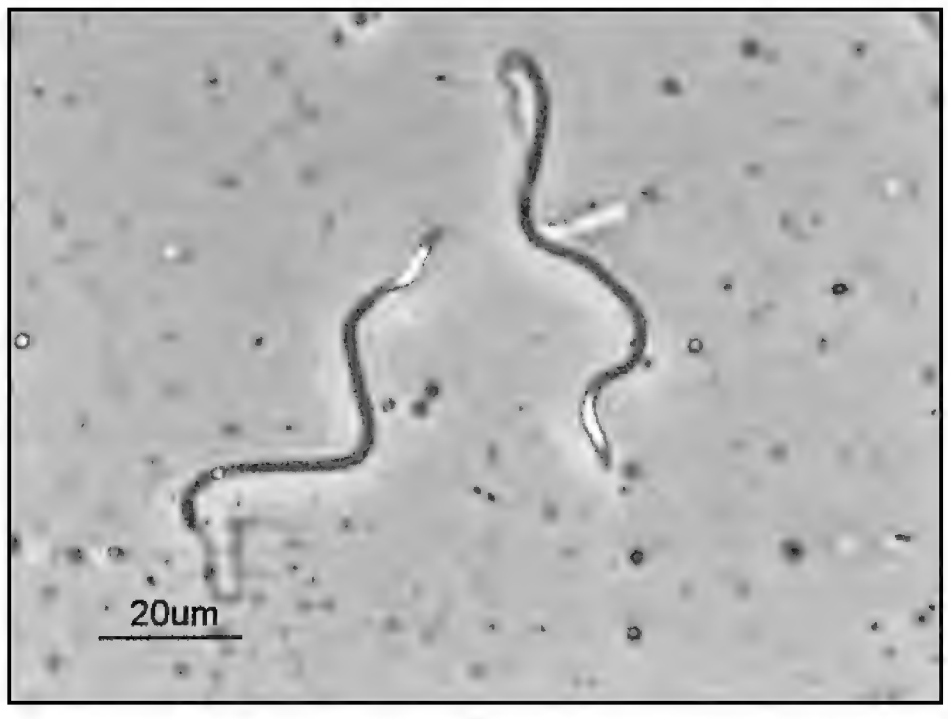
Her talked was titled "Sexual Selection and the Mating Strategies of New World Natricine Snakes." In her words, "we're going to talk about snakes and sperm and mating and it's going to be fun." And it was.

Terri started by talking about mating systems in general, which range from total monogamy to total promiscuity and everything in between. She dropped interesting little facts such as the more sexually dimorphic mammals are, the more likely they are to be promiscuous. Different reproductive success is typical and can be within species, between sexes, or within sexes. It's an area that is ripe for study, and Terri obviously relishes the challenges involved in exploring the serpentine side of the issues. Her study covered questions involving subfamily reproduction, sexual strategies within a population, and sperm characteristics of two species.

In snakes the males are usually the competitors for mates using either male combat or endurance competition such as the mating balls of garter snakes leaving a hibernaculum. Terri pointed out that in the latter case the females choose their mates, though it may simply be out of exhaustion. In snakes sexual selection may be intrasexual or intersexual, and may occur premating or postmating, where the sperm from two males compete to fertilize the female's eggs. Natricine snakes typically use the endurance method of premating competition and most use cloacal plugs to give them an advantage in the postmating phase, though Terri mentioned a couple of strategies that render the plugs ineffective. There are about 55 species of natricine snakes in North America, all of which are live-bearers with keeled scales. Multiple paternity is common in natricines and had been documented in three of

the major clades and subclades of that subfamily. Terri wanted to see if there was evidence that multiple paternity might be characteristic of species across the natricine phylogeny. She acquired seven additional species selected to represent all clades, including the diamondback water snake (*Nerodia rhombifer*), which are " . . . disgusting gross snakes . . . beautiful, but gross and disgusting." This is a person who really likes snakes, but obviously a realist. When she received her first proof of multiple paternity in red-bellied snakes (*Storeria occipitomaculata*), she was so excited that she kept it to herself for a few days, savoring the results. She went on to show multiple paternity in all natricine clades and subclades but one.

She then pursued a study of the mating system of a population of plains garter snakes (*Thamnophis radix*) on the campus of Northern Illinois University. She described the plains garters as, " . . . pretty gentle, I mean you know they'll bite you and stuff but for the most part they're pretty sweet little snakes and they're very pretty . . . " Over a period of several years she collected gravid females and males, genotyped them, held the females until they gave birth, then genotyped the offspring. She had several questions she wanted to answer. "How frequently does multiple paternity occur within that population? Do multiple-sired litters differ from singly-sired litters with respect to litter size, proportion of stillborn offspring, neonate mass, or neonate length? Do dams of multiply-sired litters differ from dams of singly-sired litters with respect to postpartum mass or post-partum length? Can sperm-carryover between years be excluded as an explanation for multiple paternity in litters between years? Is polyandry within this population due to intersexual conflict or genetic compatibility?" In Terri's study population, 81% of the litters displayed multiple paternity, but some had only one or two of the litter mates sired by a different male. Terri first treated those litters as multiple paternity (MP) and then single paternity (SP) and got different results leading to different conclusions in each case. MP litters with the original data were significantly larger than SP, but not with the revised data, and SP litters had a higher proportion of stillborn offspring with the revised data, but not with the original data. There was the possibility of sperm carryover but this study could not provide a definitive answer and Terri still ponders that question. With an extra test of the



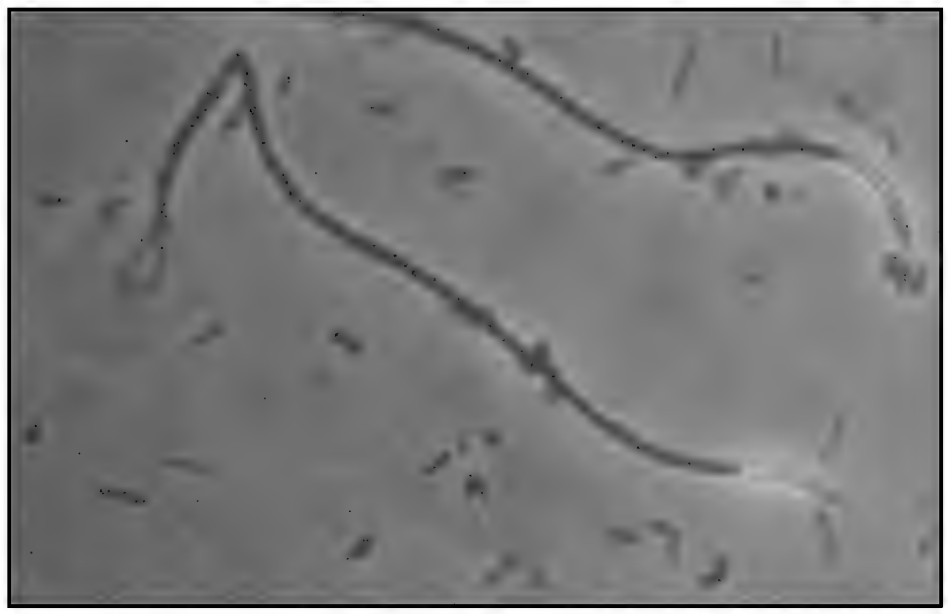
Terri's first portrait of snake sperm (*Thamnophis radix*). "They kinda look like little snakes. They've got little pointy heads. . . ." Photograph by Theresa Wusterbarth.

There are no field guides for snake sperm identification. This one is a normal *Thamnophis butleri*. Photograph by Theresa Wusterbarth.

deviation from Hardy-Weinberg equilibrium (you'll have to pursue that one on your own. I did.), Terri determined that there was no evidence of inbreeding and minimal evidence of outbreeding in this population. That led her to believe that polyandry in the DeKalb population of *T. radix* was likely due to females mating with males simply because the males are there and annoying rather than because females are trying to increase variability in their offspring by some genetic selection process. Presumably there is no selection pressure to mate with multiple males if genetic diversity is already high.

Her questing mind then turned to sperm, and she wanted to explore the characteristics of gartersnake sperm cells and analyze sperm quality. Allow me to slip in one of my paeans to the scientific mind, particularly the ones that contemplate biology. Terri exemplifies the character of nearly all of our speakers, people working in an under-funded field because they love the pursuit of knowledge, especially when it concerns herps. Large grants are generally not there for the kind of research Terri so obviously loves to pursue, so most of those studying come up with ingenious methods to pursue their goals. As with all competent scientists, biologist must first determine the questions then develop the means to test the questions, both of which can be truly creative acts, but biologists frequently are exploring areas where no one has ventured, often because no one cares enough to fund such explorations. As it was with snake sperm. Terri found little previous work, and in trying to find ways to work with sperm, she turned to the people who make money from sperm, cattle breeders. She spent days watching sperm collection from bulls and then brainstormed methods for collecting from snakes. She bought them clothes from Frederick's of Hollywood and . . . OK, OK, she didn't do that, but she did explore the idea of tiny condoms. In the end she collected the sperm by covering the male's head in the presence of females and gently massaging the area just posterior to the cloaca. Did I mention that herp scientists are dedicated?

What does one do with snake sperm? You take pictures of it,



An abnormal sperm cell with a kinked midpiece. Photograph by Theresa Wusterbarth.

and once again Terri turned to the sperm-money people in the guise of Dr. John Parrish, a professor at the University of Wisconsin in reproductive physiology specializing in bulls and stallions. With his help, guidance, and even funding, Terri set out to compare the sperm of *T. radix* with Butler's garter snake (*T. butleri*), two species that are known to hybridize in the wild. She wanted to explore the general characteristics of the sperm cells, determine if there is significant variation between or within species, study the types and frequencies of abnormalities, and measure possible variations among males or among groups of siblings in abnormalities.

She found significant differences in the sperm cells among littermates but no significant differences among litters. There were significant differences among males of each species, but no significant differences between species (remember, they do hybridize). And Terri thought the rate of abnormalities, particularly decapitation (53.6%), seemed higher than it should be.

I suspect that many reading the title of her presentation thought that it might be academic and boring. Academic it was, but Terri proved that even relatively abstract topics need not be boring. She is an enthusiastic and accomplished speaker and her talk was informative and entertaining while demanding some attention and educating us not only in some of the intricacies of sexual selection but also the workings of a first-class scientific mind.

I had the honor and the shame of presenting awards to some special members of your society at February's meeting. Shame because the recognition from me came all too late for the recipients. For the three years I was president we awarded nothing, and that was wrong, but it was an honor to finally present the awards. The members who work and propel your society deserve recognition. There are many, and it's very difficult to choose the particular members who take that extra step and devote special effort to our goals. The selection committee, headed by Dick Buchholz, had a difficult task, but there is no doubt that the persons selected are deserving.

Molly Carlson is one of our younger members. For several years she has helped with the difficult job of setting up Reptile-Fest, particularly making sure that our photo booth looks really good, but also attending several smaller educational shows especially the Notebaert weekends. I've known her for a while and have had the pleasure of working with her. She's a teenager who represents your society in an exemplary manner and rightly deserves the Youth Merit Award.

Linda Malawy is past president, stepping in when the office was vacated unexpectedly and doing an awesome job. She has been on the board of the CHS for several years, nearly single-handedly organizes the Herps of Illinois table at ReptileFest, and does single-handedly run the adoption program. I have only an inkling of what either of those last two jobs entail, but I know that both take much time and effort. Linda also finds time to do educational shows. Linda has received the Merit Award.

Rick Hoppenrath joined the society and quickly became the go-to man if we needed something done. He's past vice-president and has been ReptileFest coordinator for the last two years. We don't usually have to ask Rick to do something because he'll frequently volunteer as soon as he sees a need. He and his wife Mary, who deserves an award of her own, have spent many an hour making your society the outstanding organization it is. Rick received the Merit Award.

Bob Bavirsha continues to astound me with the time and effort he puts into your society. He is always the first to set up and the last to take down at ReptileFest, mainly because he always has the biggest and most complicated, and usually the most popular, display. He readily volunteers to do shows to which he hauls his normally huge animals. He is expert at construction, a great presenter, and never takes credit, usually deferring to the society as the deserving party. It's been too long in coming, but Bob certainly deserves the Lifetime Merit Award.

The above awards were the result of the selection committee, but I got to choose the recipient of the President's Award. The task was not easier than the selection committee's for there are numerous deserving candidates, but I finally decided that Dick Buchholz should be the recipient. Dick is unwavering in his devotion to the society, and since he was one of its early founders and past presidents, one can understand that devotion. The first weekend of every month Dick is at the Peggy Notebaert Nature Museum, spreading the word about your society and educating people about herps. He's good at it and he should be, because Dick made his living giving educational shows to schools. Whenever I asked Dick to do something, he rarely said no. It's nice to have someone that you can depend upon if others are vacillating. Thanks Dick.

Lastly we corrected the error of not acknowledging the men and women who have served as president of the CHS in the last several years. Lori King served from 2003-April of 2005, Linda Malawy served the remainder of 2005, and Rich Crowley served in 2006. I know what that job entails, and the CHS owes each a tremendous debt of gratitude. Thank you, past presidents.

Bull. Chicago Herp. Soc. 46(3):35-36, 2011

Problematic Philanthropy: Giving Away Money Is Harder than You Might Think

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- *Impacts of Landscape Alteration on Freshwater Turtle Populations.*
- *Status and Conservation of Mauritian Fauna and Flora Threatened by the Invading Madagascar Giant Day Gecko,* Phelsuma grandis.
- *Effects of Predator Stress on Immune Function and Susceptibility of Anurans to the Emergent Infectious Disease* Batrachochytrium dendrobatidis.
- *Venom Function in Pitvipers: Does Prey Envenomation Enhance Digestive Performance and Reduce its Cost?*
- *Salamanders Mediate Below- to Above-ground Interactions through Direct, Indirect, and Ecosystem Engineering Pathways with Earthworms.*
- *The Natural History of Two Wood Turtle (*Glyptemys insculpta*) Populations in Southwestern New Hampshire.*
- *A Study of Aposematism in the Strawberry Poison Dart Frog (*Oophaga pumilio*): The Effect of Density, Spots, and Color on Predation with Conservation Implications.*
- *Character Convergence in Sympatry of Aggressive Calls in Two Frog Species,* Hyla chrysoscelis *and* Hyla versicolor.

Wondering about the above? What they have in common? I know you recognize that they're studies, but maybe you don't know that you are partially responsible for every one of them. The Chicago Herpetological Society has the stated mission of education, conservation, and the advancement of herpetology. Toward those goals, every year for over twenty years we've offered grants to suitable applicants. The studies listed above are just a few that we have supported in the past. Some of you might not be aware that your society awards grants each year to individuals or institutions that submit their proposals by the last day of the year. These grants are limited to applicants who are members of the Chicago Herpetological Society as of the last day of the year the grant is submitted. Instructions for submissions are included on the CHS website. The applications should fall within one of five categories: Illinois herpetology; graduate research in herpetology; undergraduate research in herpetology; conservation; and captive management, propagation, and husbandry.

For the first time I had the honor of being on the selection committee for those awards. I was impressed not only by the quality of the admissions but also by the seriousness of the committee. Our president, Jason Hood, Mike Dloogatch, Jessica Tschampa, and Steve and Amy Sullivan volunteered their time, and the Sullivans hosted the final meeting at their home. In spite of all the other demands upon her time, Amy even managed to cook up some snacks for us. We understood that these funds, as small as they may be in the overall economy, could mean a furthering of studies that may expand biological science, promote individual careers, or help save endangered species. Taking all this into account was sobering indeed, so I didn't think about it . . . too much. We read all the applications, took extensive notes, and tried to come up with a way to distribute our limited funds while bemoaning our inability to finance all of the proposals. I know that we've given money in the past to some outstanding causes, but I wasn't prepared for the quality of each application. As I read through the twenty-four proposals we received this year it gradually dawned on me that this was not going to be an easy selection process. All of the applications had merit. The problem became how to reasonably allocate the $5,000 the CHS board had approved for this year.

The committee wanted to do justice to the effort that all of the applicants had expended, so we worked at determining which proposals would edge out others. We debated each proposal and discussed our impressions from our studies. We munched on brownies. We argued. We chewed. We discussed. We ate quiche. We disputed. One proposal might be original but have only a slight chance of succeeding. Another might be interesting but not developed fully. One of the committee members might really champion a study that others thought was not one of the top contributions. Was the proposed budget realistic? We liked the public involvement of some of the petitioners and the organization of others. Should we give this one the max allowable or will less of an award allow us to partially fund another? Does this letter of recommendation seem sincere or merely a formulaic response to a request? It wasn't easy, but the food helped to stimulate us and we finally chose seven that we thought were slightly more deserving than others.

Reprinted from last month's *Bulletin*:

2011 CHS GRANT RECIPIENTS

• Melissa Amarello, SoLS Graduate Program, Arizona State University. "The Role of Kin Selection in Rattlesnake Aggregations," $1,000.

• Gerardo Antonio Cordero, Ecology, Evolution and Organismal Biology, Iowa State University. "How Does the Turtle's Shell Get Its 'Hinge'?" $500.

• Richard L. Essner, Ph.D. Department of Biological Sciences, Southern Illinois University Edwardsville. "Captive Husbandry in the Rocky Mountain Tailed Frog, *Ascaphus montanus*," $1,000.

• Maxwell B. Joseph, Department of Ecology and Evolutionary Biology, University of Colorado, Boulder. "The Legacy

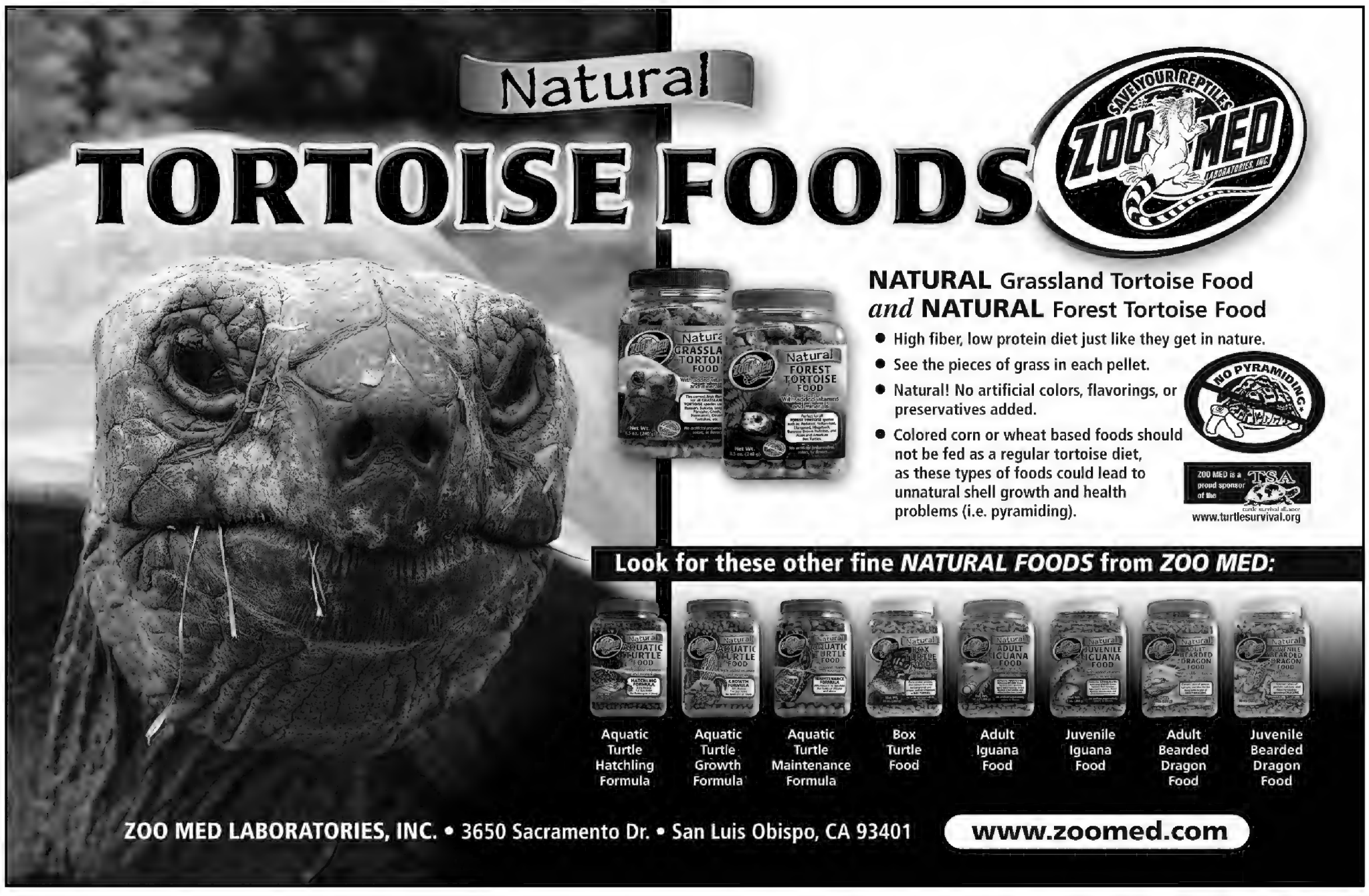
of an Emerging Disease: Post-epizootic Pathogen Persistence in the Landscape," $500.

• Justin Perrault, Department of Biological Sciences, Florida Atlantic University. "Salps to Sea Turtles: Mercury and Selenium Concentrations in Leatherback Sea Turtles and Their Prey. Does Biomagnification Lead to Low Hatch and Emergence Success?" $500.

• Joshua Scholl, Florida Atlantic University (undergraduate). "Gopher Tortoise Burrow Distribution and Demography in a Declining Southeastern Florida Habitat," $1,000.

• Melanie N. Stock, Department of Soil Science, University of Wisconsin-Madison. "Urban Heat Island Effects on Deep-Terrestrial Hibernating Amphibians," $500.

We were dissatisfied with the results. We wanted to fund them all. In a perfect world the Chicago Herpetological Society would have money to fund all of the applications, but we don't. We do what we can, struggle to distribute our money fairly, and know that we'll fail. But we also know that there are funds now for some projects that would not otherwise be funded. In the world of biological research, funding for anything herpetological can be difficult to acquire. As a member of the CHS, you have a part in making it a little easier. And you can do even more by adding a donation to our grants fund next time you renew your membership or any other time. Advancing the field of herpetology, just one of our missions.



Herpetology 2011

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

SPECKLED TORTOISE DEMOGRAPHICS

V. J. T. Loehr [2010, Chelonian Conservation and Biology 9(2): 223-230] notes that *Homopus signatus signatus* is a small tortoise endemic to arid northwestern South Africa, where its range is threatened by aridification. It is not clear how the taxon will respond to an aridifying habitat, emphasizing the need for population monitoring. A mark–recapture study was conducted over 5 years with above- and below-average rainfall to analyze population structure, abundance, apparent survival, and effects of rainfall. The population had a continuous size-class distribution and contained similar frequencies of males, females, and juveniles, indicative of a viable population with reproduction and recruitment into adulthood. It consisted of transient and resident individuals, with an abundance of 16–21 resident tortoises/ha. High spring activity levels appeared to result in high (0.35–0.94) recapture rates, which differed among years as a result of different search efforts. Apparent annual survival rates of residents depended on group and increased with shell volume, ranging from 0.74 to 0.99. Although females were the larger sex, their apparent survival tended to be slightly lower than male survival, possibly because of high female activity to accumulate nutrients for the production of large eggs. Rainfall apparently had little effect on survival, suggesting that physiological responses to drought exploited by *H. s. signatus* are effective in helping them survive. Consequently, mortality during current, periodic droughts does not seem to oppose recommended conservation measures to improve adult survival and delay detrimental effects of aridification on growth and reproduction.

SALAMANDER POSTHATCHING PARENTAL CARE

F. Oneto et al. [2010, J. Herpetology 44(4):649-653] note that posthatching parental care is known in amphibians for frogs and caecilians but, thus far, has never been reported for salamanders. The authors describe the parental behavior of a female northwest Italian cave salamander, *Speleomantes strinatii*, from egg deposition to nest site abandonment. The female was kept in semi-natural conditions and filmed in complete darkness by an infrared video camera. In November 2007, the female laid nine eggs in a small depression of the terrarium floor, displaced the clutch with hind limbs, and showed antipredator behaviors toward a conspecific female and an intruding roof rat (*Rattus rattus*). While egg brooding, the female stayed in contact with the clutch about 98% of the time. In September 2008, two young hatched and shared the nesting site for six weeks with the female, who attended the nesting site 87% of the time. Hatchlings repeatedly climbed over the female's body, lying on her for hours. The female left the nesting site with a young on its back twice. These prolonged skin contacts between parent and offspring should be considered as the first certain case of young attendance in salamanders. This behavior may be related to increased survival of hatchlings during their first weeks of life, when young are particularly vulnerable to predation, skin infection and dehydration.

EFFECTS OF INSECTICIDES AND PREDATORS

C. M. Ade et al. [2010, J. Herpetology 44(4):591-600] note that worldwide amphibian population declines have occurred in the last few decades and have been attributed to a range of factors including introduced species and chemical contamination. Anuran species may differ in their susceptibility to declines based on life-history characteristics, leading to different probabilities of decline and conservation statuses. The authors looked at two anuran species, northern cricket frogs (*Acris crepitans*) and green frogs (*Rana clamitans*), reared in mesocosms containing a common invasive or introduced potential predator (rusty crayfish, bluegill sunfish, or triploid grass carp) and imidacloprid, a common insecticide. It was found that anurans differed in their sensitivity to these factors. Cricket frog survival was significantly reduced with imidacloprid exposure, whereas green frogs were not. Abundance of both amphibian species was reduced in the presence of predators, particularly the fish. The study suggests that cricket frogs may be especially sensitive to the insecticide imidacloprid, as well as fish predators, and that these factors could contribute to their population declines.

ANTIPREDATOR SKIN SECRETIONS

G. R. Hopkins and S. W. Migabo [2010, J. Herpetology 44(4):627-633] note that distasteful, noxious, and toxic secretions from skin glands have been demonstrated to play important antipredatory roles in amphibians. Previous studies suggest that the long-toed salamander (*Ambystoma macrodactylum*), a widely distributed urodele found near the northern limit of its range in northern British Columbia, is distasteful to predators. The source of this distastefulness has not been exclusively identified. The objectives of this study were to isolate the skin secretions of the long-toed salamander through electrical stimulation of its granular glands and bioassay this secretion for antipredatory effects with crayfish. Previous studies suggested that proteins play an important role in these secretions; therefore, we tested for their presence and utility. The feeding response of crayfish to control food pellets was compared to pellets incorporating raw salamander skin secretions and to pellets incorporating boiled secretions. Significantly more crayfish consumed the control pellets than the raw skin secretion pellets, indicating unpalatability of these skin secretions. Thus, skin secretions appear to have an important antipredatory function. Skin secretions tested positive for presence of proteins, but the feeding response of crayfish to raw and boiled secretions was not significantly different, indicating that proteins were either only partially denatured by boiling, or are not exclusively responsible for the antipredatory nature of the secretions. A very low concentration of secretion was required to elicit a significant antifeedant response in crayfish, and the authors discuss the possible implications of this in relation to a proposed dual function of the long-toed salamander's granular glands in nutrient storage and the energetic requirements of an amphibian in its northern range.

Unofficial Minutes of the CHS Board Meeting, February 11, 2011

The meeting was called to order at 7:50 P.M. at the Schaumburg Public Library. Board members Greg Brim, Lawrence Huddleston, Aaron LaForge and Linda Malawy were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the January 14 board meeting and they were accepted with minor corrections. Cindy also mentioned that she will not be at the March meeting and Jenny Vollman will take the minutes.

Treasurer: Andy presented the January financial report. It was discussed and accepted.

Vice-president: John Archer and Jason Hood discussed having a poster at 'Fest describing our upcoming speakers to entice folks to come. Deb Krohn volunteered to look into it.

Membership Secretary: Mike Dloogatch read a list of memberships expiring this month. Mike needs to have more renewal notices printed, so he will be adding the information about being able to pay via PayPal.

Corresponding Secretary: Deb Krohn needs more letterhead. Mike will email a PDF so she can create her own.

Committee Reports

Shows:
- Project Exploration Dinner with a Dinosaur, February 25
- Kids Expo, February 26–27
- Notebaert, March 5–6, April 2–3.
- Reptile Rampage, March 13
- Chicagoland Family Pet Expo, March 18–20.

Grants: The Grants Committee will meet on February 12. Mike Dloogatch moved to allocate $5000.00 to the grants program. Cindy Rampacek seconded and the motion passed unanimously.

Old Business

Service awards: Dick Buchholz has had them made and will give them to Jason tonight so that they can be given out at the February meeting.

Magnets: The board okayed the design Cindy Rampacek got. John moved to allocate up to $500 to purchase the new design. Jenny Vollman seconded the motion and it passed unanimously. Cindy will contact Rick Hoppenrath and have him order.

CHS member and attorney, Peter Berg, obtained a copy of the former member's trust, which names the CHS as a beneficiary. Mike and John looked at it; it is a confusing document, but it appears we have a nice donation coming. Peter will send a letter on our behalf to accept the donation.

Zoo trip: Deb has some quotes for the bus. It appears that the trip will cost approximately $50.00 per person. We are currently working on the contact person at St. Louis Zoo and the trip is planned for June 25.

New Business

Queens of the Stone Age: Mike has received a donation from Marcia Rybak of an Emek Queens of the Stone Age laser-cut poster promoting their tour. Mike will hang on to it for a while until we decide what to do with it..

ReptileFest—scouts, banners, ticket giveaways:
- Thanks to Kingsnake.com and Kim Klisiak for the banner ads for the event.
- Jason wants to prepare things for scouts to work toward their merit badges at 'Fest. Deb will check the boy scouts and Cindy will check the girl scouts.
- Deb asked for a little help rounding up speakers for the show.
- We will look into giving away tickets to 'Fest at schools and radio shows.

Round Table

Jim Foster enjoyed getting out and doing a show with Dick Buchholz and Mike Scott.

Deb wants to order Hypno-toads to sell at 'Fest.

Dick mentioned that at the American Outdoor Sports Show, a new CHS member showed up and got some show experience.

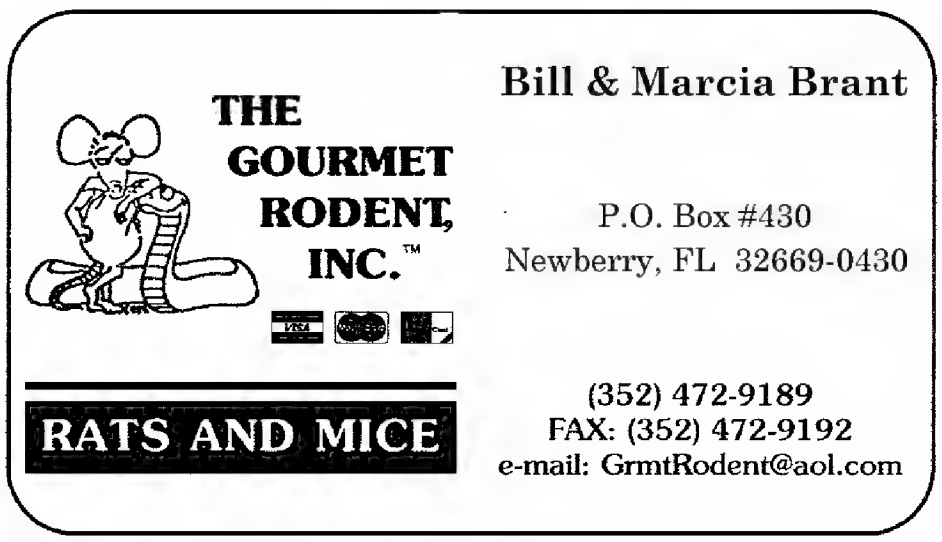
Bob Bavirsha facilitated a research day with students from the University of Illinois and Purdue University, using carcasses of animals found dead or dying by Animal Control officers.

John mentioned that his trip to Equador with Bryan Sison's Biophoria Tours was a wonderful experience.

Jason brought up that a bill had failed to pass in the Illinois legislature that would have limited to seven the number of companion animals per household. It's not clear if companion animals would have included reptiles.

The meeting was adjourned at 9:37 P.M.

Respectfully submitted by recording secretary Cindy Rampacek



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. Our mice and rats are vacuum-packed to greatly extend freezer life by reducing freezer burning and preserving vitamin and nutrient content. We feed our colony a nutrtionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. For a complete price list please visit our web site, www.themousefactory.com. We accept all major credit cards, PayPal or money orders. Call us **toll-free** (800) 720-0076 or send us an e-mail at info@themousefactory.com. Write us at PO Box 85, Alpine TX 79831.

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice availabe: small newborn pinks up to jumbo adults. Prices start at $25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: Rats—live or frozen. I breed rats for my collection of boas so only top quality lab chow and care will do, I'm now offering surplus animals for sale. Located in far south suburbs of Chicago. Only orders of 20 or more please, no large rats will be available. For current availability and prices, please e-mail Steve at smuys@sbcglobal.net.

For sale: New book, 2011, just released: *Matamatas; The Natural History, Captive Care, and Breeding of* Chelus fimbriatus by David Fogel. The most comprehensive volume on this fascinating turtle. Well researched, 64 pages, with 49 literature citations. Well illustrated with 58 full-color photographs of captive specimens, their enclosures and filtration set-ups, wild specimens, and habitat. This book in the Turtles of the World Series will present readers with a look at the life of this amazing turtle in nature and in captivity. Enclosure designs, filtration details, and specific captive care requirements are included. Signed or personally inscribed and signed (provide instructions with order) copies are available from the author for $12.99 each plus shipping ($3.00 for the first copy & $1.00 each additional copy to US addresses, and $7.00 each for international destinations). Send check or money order to: David Fogel, 1750 Haines Road, Orwell, OH 44076. Payment through PayPal (including credit card payments) can also be accepted at herphouse1@aol.com. Please send any inquiries to this e-mail address.

For sale: Two 8-month-old Amazon Milk Frogs (*Trachycephalus resinifictrix*), $50 each or both for $90. One 2-year-old male Mandarin Rat Snake (*Euprepiophis mandarina*), $300, only eats live mice. E-mail: mattroconnor@gmail.com.

For sale: Trophy quality jungle carpet, diamond-jungle, and jaguar carpet pythons. Website: moreliatrophyclub.com E-mail: junglejohn@tds.net.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney 305 664-2881

Herp tours: **The Ultimate Bushmaster Experience**: five days in and out one of the world's hotspots, the Atlantic Rainforest in Brazil, with safety and confort, and also some work in a captive breeding center, guided by a specialist in the genus *Lachesis*. Groups of six people. Please contact Rod Souza, M.D lachesisbrasil@hotmail.com

Herp tours: The beautiful Amazon! Costa Rica from the Atlantic to the Pacific! Esquinas Rainforest Lodge, the Osa Peninsula, Santa Rosa National Park, and a host of other great places to find herps and relax. Remember, you get what you pay for, so go with the best! GreenTracks, Inc. offers the finest from wildlife tours to adventure travel, led by internationally acclaimed herpers and naturalists. Visit our website <http://www.greentracks.com> or call (800) 892-1035, E-mail: info@greentracks.com

Wildlife Tour—Australia: October 21–November 7, 2011. Lamington and Kakadu National Parks and the Atherton Tablelands of northeast Queensland. Visit subtropical and tropical rainforests and archetypical Australian outback. Although the focus is on birds on this trip, we will see much other wildlife, too. All of our local guides are excellent all-round naturalists. On last year's tour, we saw many herps including both freshwater and estuarine crocodiles, saw-shelled turtles, Boyd's forest and eastern water dragons, land mullet, lace monitor, frill-necked lizard, carpet python, common tree snake and taipan. Mammals seen included ten kinds of kangaroos and their kin, flying foxes, dingo, and platypus. And red-tailed black cockatoos, golden bowerbirds, wedge-tailed eagles, Gouldian finches, hooded parrots, laughing and blue-winged kookaburras, and a cassowary, among many other birds. We stay in comfortable accommodations and relish tasty meals. Maximum group size is 14. If you enjoy visiting wild places with knowledgeable local naturalist guides in the company of fellow travelers who appreciate nature as you do, then consider this tour to spectacular settings. The land cost is $5495 per person double occupancy. For an itinerary and more information, please contact Bill Turner at (303) 795-5128 or e-mail: toursbyturner@aol.com.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: MADadder0@aol.com

Bull. Chicago Herp. Soc. 46(3):40, 2011

April's Guest Speaker: Mike Rochford

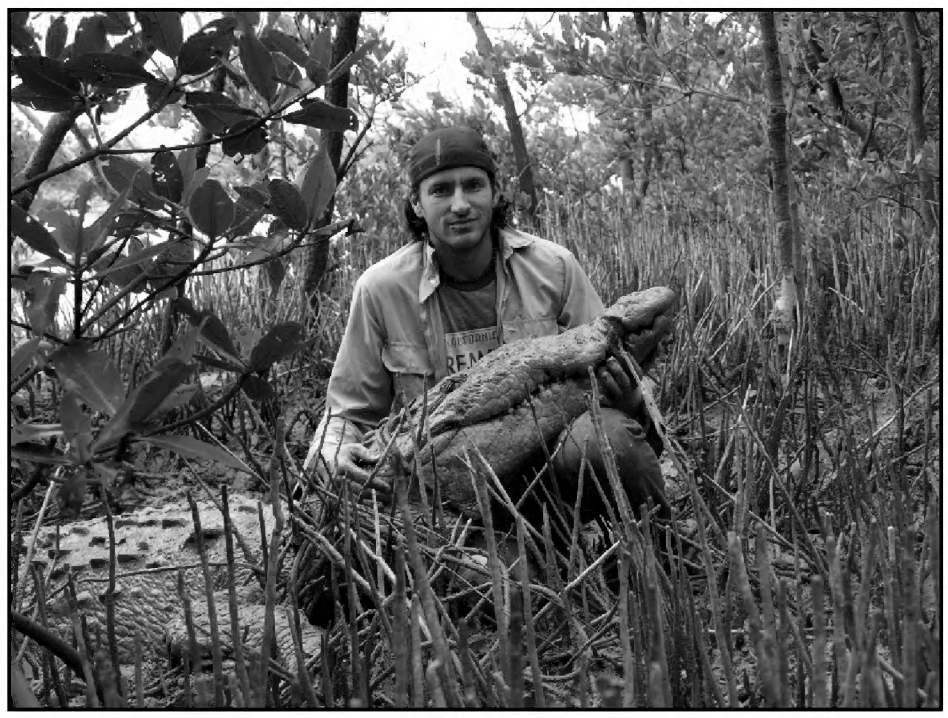
Jeffrey Coleman
Whitney M. Young Magnet High School
jeffcoleman844@gmail.com

Mike Rochford always knew he wanted to pursue herpetology as a career. He always wanted to work with reptiles and amphibians, particularly snakes. The position he has now, as a wildlife research assistant under Dr. Frank Mazzotti was one he was lucky enough to find through the University of Florida as a job advertised as researching alligators. He found the work after a year of research in Missouri on massasauga rattlesnakes and conducting herpetological surveys in Colorado, before which he was earning his bachelor of science degree in biology from Kansas State University.

The people he started working with were the same people working on the python research. As the python project started to expand, the herpetologists he was working under saw that he was interested in it and started to give him more and more python-related work up until present day. Now, he spends almost all of his work time with pythons.

In his daily life he describes himself as being extremely fortunate in the variety of his work, from organizing data and looking at remains and what the snakes ate in a lab to doing the research he discussed on a recent PBS segment, being able to document and control the invasion / infestation while attempting to eradicate, trap, and contain the giant pythons found in Florida, such as the northern African python (*Python sebae*) and the Burmese python (*Python bivittatus*).

When I contacted Mr. Rochford, he told me a little bit about the kind of things he is working on now. Currently, he and his team are radio-tracking pythons, documenting and writing papers about the pythons' diet, and road cruising in the Everglades to investigate the native snake community. He also enjoys going on herpetology trips across the country every year and can be found on herpetology forums online.



ReptileFest 2011, April 9, 10

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, March 30, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dan Warner**, a postdoctoral research associate in the Department of Ecology, Evolution and Organismal Biology at Iowa State University, will describe his doctoral research at the University of Sydney (Australia) temperature-dependent sex determination of jacky dragons (*Amphibolurus muricatus*). His talk is titled: "Why Does Nest Temperature Determine Offspring Sex in Many Reptiles? A Case Study with an Australian Agamid Lizard." Dan has begun to work with the brown anole (*Anolis sagrei*) and through an outreach program in connection with that work became involved with Golden Apple winner **Aaron Reedy**, a biology teacher at Kelly High School on Chicago's southwest side. Aaron's students are doing valuable research into nest-site selection behavior in brown anoles and Aaron will give us a short summary of the students' findings.

Speaking at the April 27 meeting will be **Mike Rochford**, a wildlife research technician at the University of Florida's Fort Lauderdale Research and Education Center. Mike will speak about radio-tracking Burmese pythons in the Everglades.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

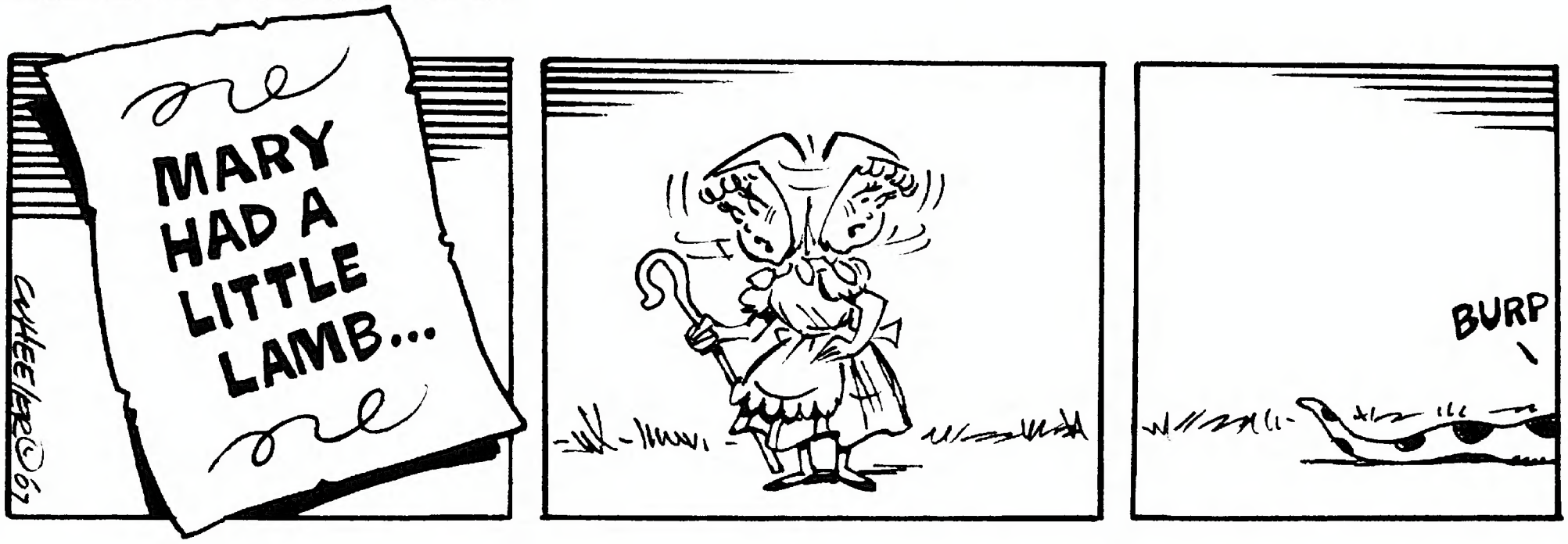
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., April 15, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the CTC website: http://www.geocities.com/~chicagoturtle.

THE ADVENTURES OF SPOT



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